The Integrated Space Weather Analysis System

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Aknowledgement: Marlo Maddox

Space Weather Training 2020

http://iswa.ccmc.gsfc.nasa.gov

HSD

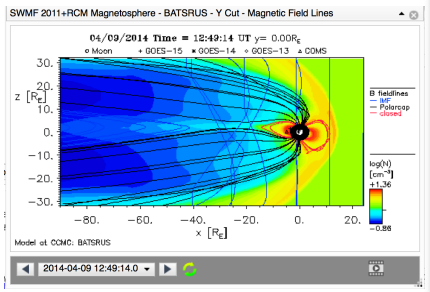
COMMUNITY COORDINATED MODELING CENTER

How Do You Quickly Determine Past, Present, & Expected Space Weather Impacts?

CCMC Tools, Systems, & Databases

for Research, Analysis, Metrics & Validation, Forecasting

Continuous Real-time Simulations



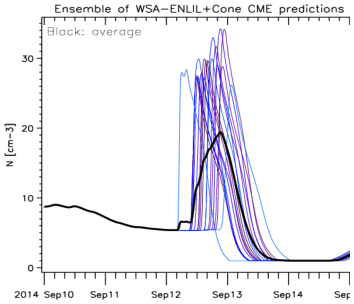
Event-Triggered Real-time Simulations

1-Click

Input Parameters Generation Tools

StereoCAT

Ensemble Simulations



iNtegrated Space Weather Analysis System

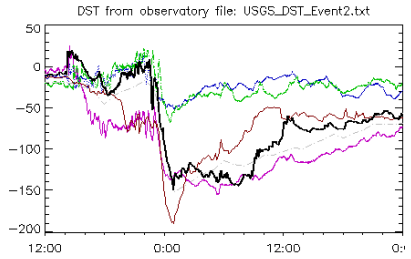
Databases:

Run Results, Events, Impacts interpretations

DONKI

Forecasting Methods ScoreBoards

M&V Suite to Trace Model Improvements

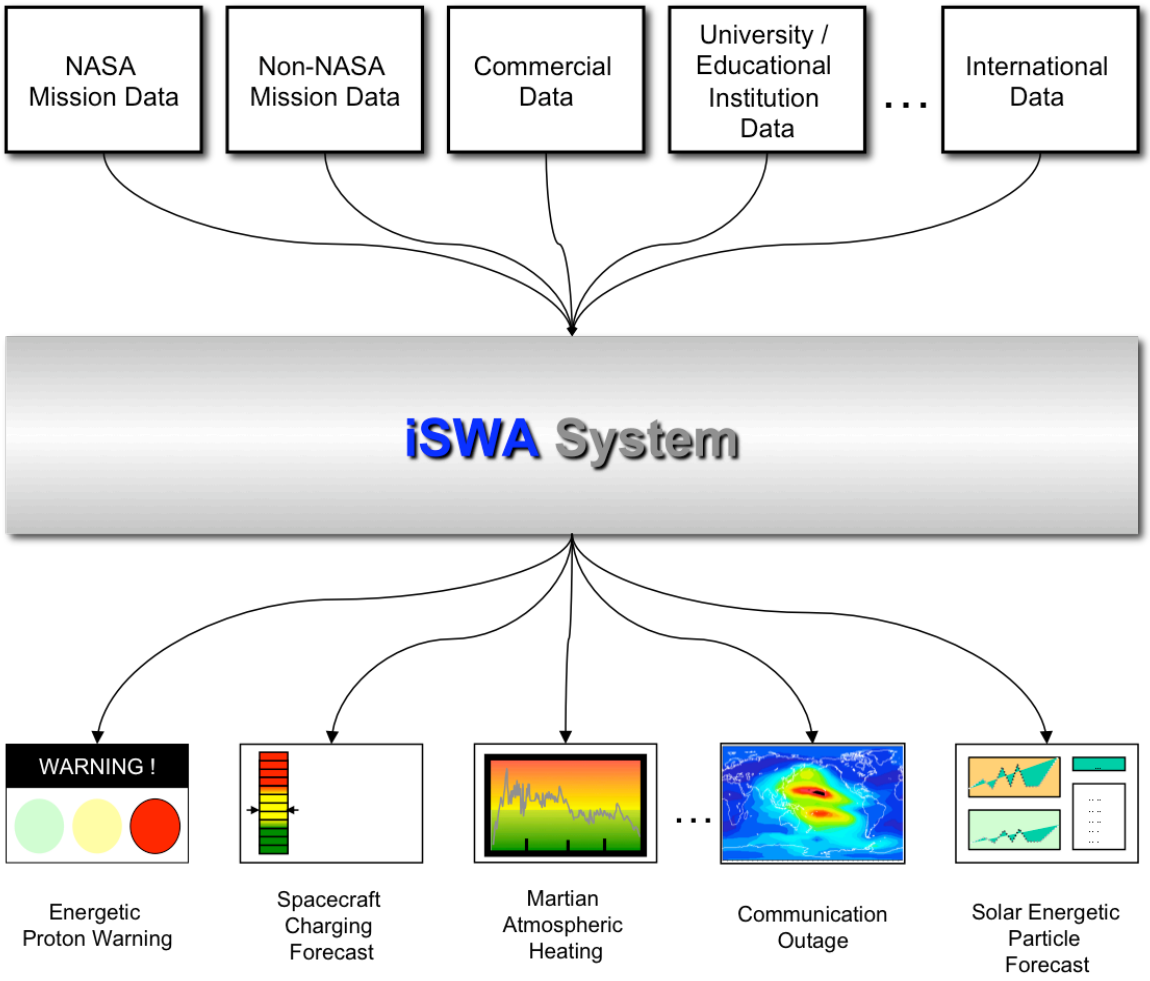



With so many NASA assets throughout the Heliosphere, the agency identified a critical need for the
Integrated Space Weather Analysis System

iSWA Solution & Deliverables

1. Acquire, ingest, and produce NASA relevant space weather information
2. Utilize both observational and simulation/model data
3. Produce and provide real-time data streams
4. Categorize and archive data for historical impact analysis
5. Provide customizable and highly configurable displays
6. Disseminate through the most widely deployed and accessible interface – the web

iNTEGRATED SPACE WEATHER ANALYSIS SYSTEM



Highly diverse and distributed space weather data consisting of the latest observational data along with the most advanced space weather model simulation output.

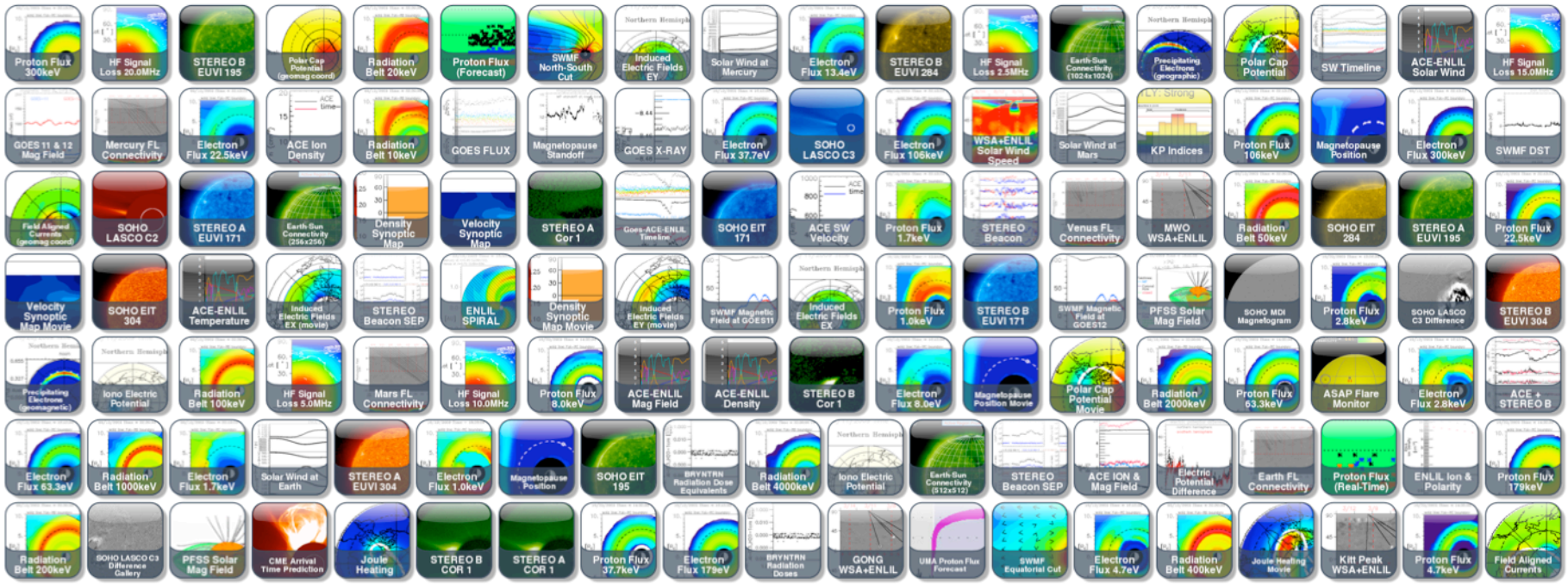
iSWA system collects data from a large and evolving list of sources. Data is sorted, characterized, and processed into 'mission decision supporting' products in response to individual user queries.

iSWA generates and provides a user-configurable display panel that can be accessed from a standard web browser. The end user can then customize their display to focus on specific products of interest.

iNTEGRATED SPACE WEATHER ANALYSIS SYSTEM

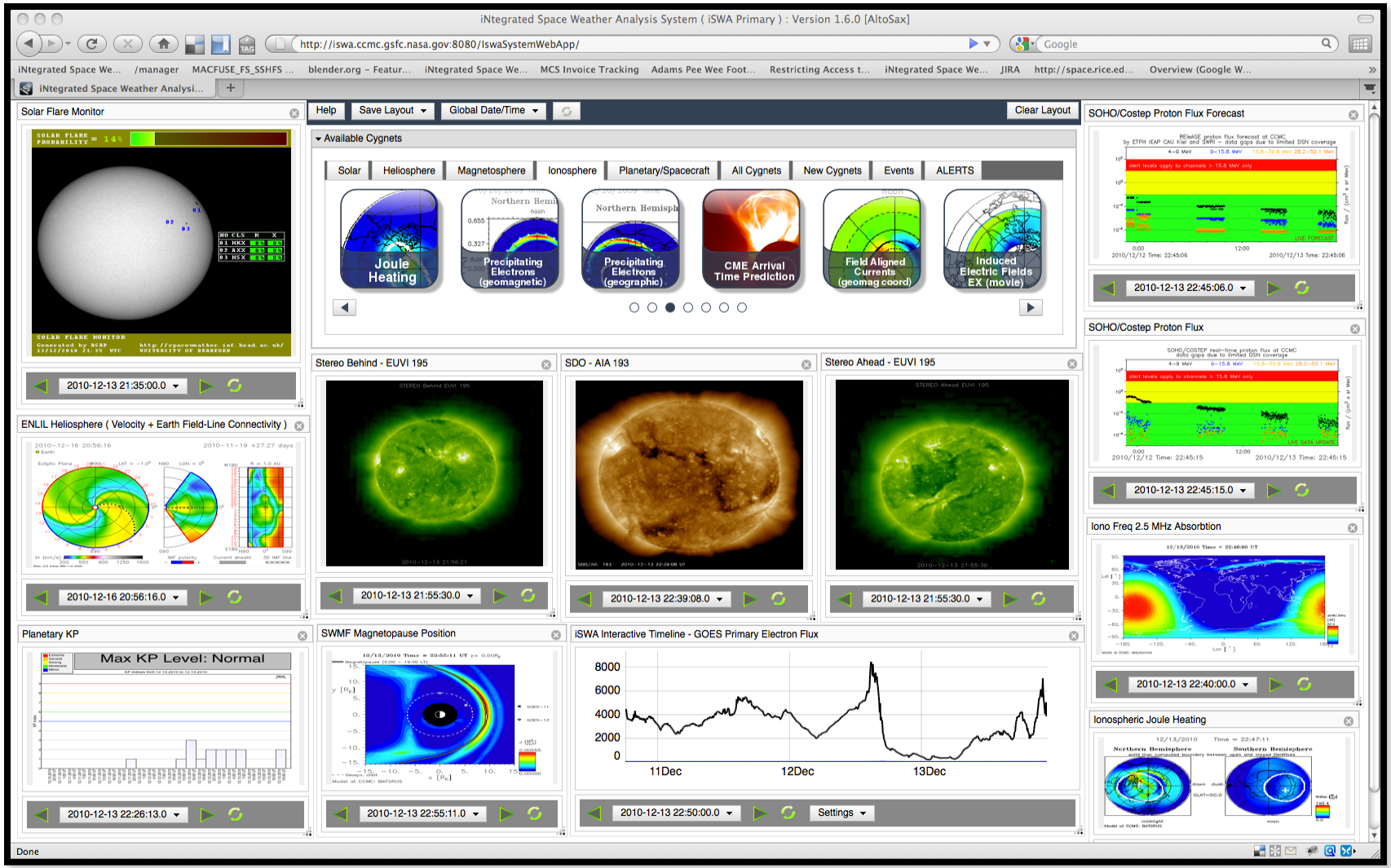
Innovative Dissemination

ISWA has ~300 products including modeling results and comprehensive sets of observational data.

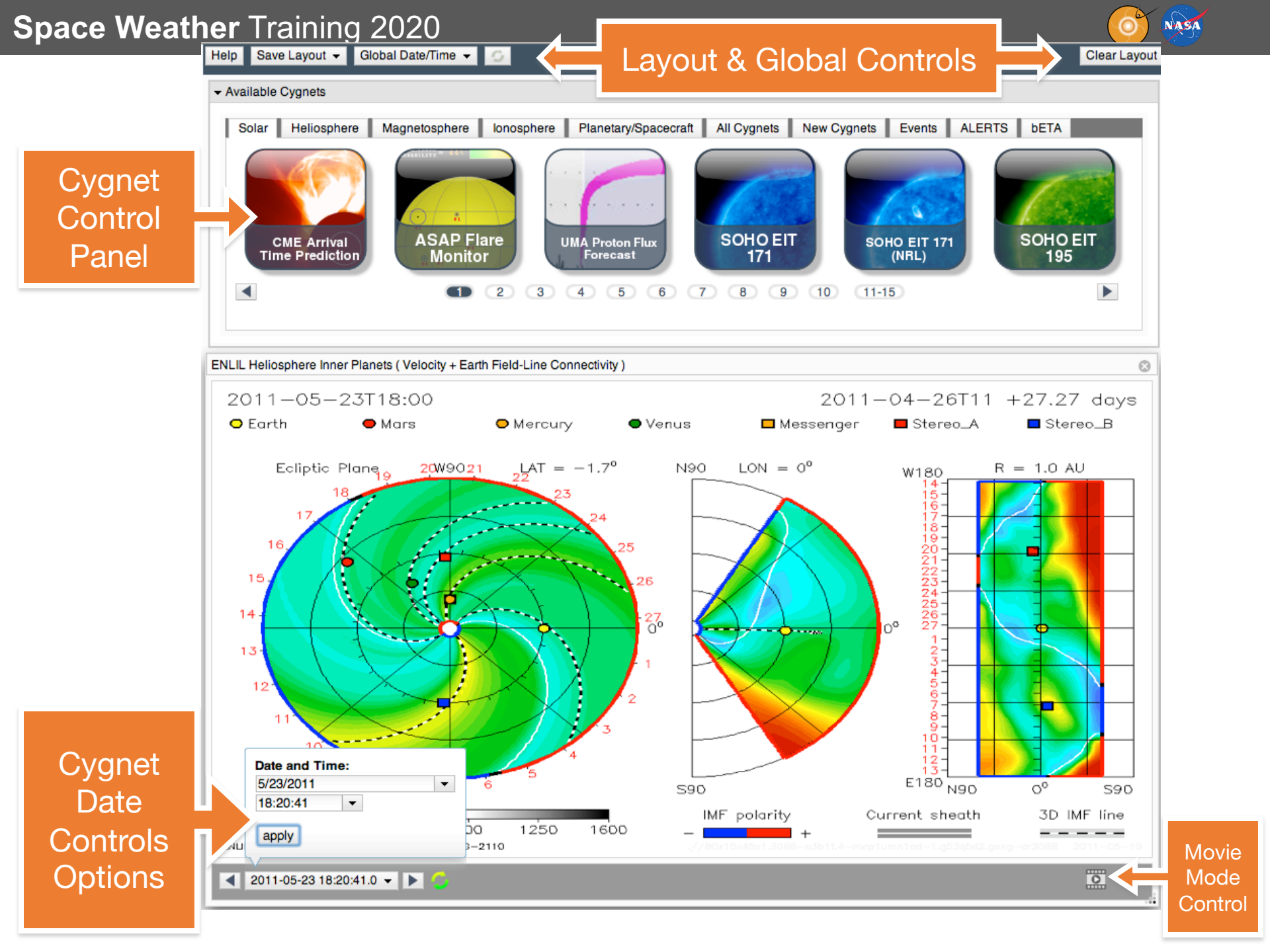


Web-based. User configurable. Available world-wide.
One-stop shop for state-of-the-art information!
http://iswa.gsfc.nasa.gov

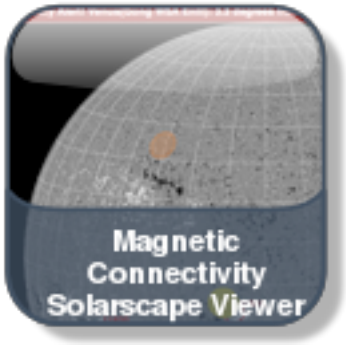
Unprecedented Access to Space Weather Information



http://iSWA.ccmc.gsfc.nasa.gov


Layout & Global Controls
Help
Save Layout
Global Date/Time
Clear Layout
Available Cygnets
Solar
Heliosphere
Magnetosphere
Ionosphere
Planetary/Spacecraft
All Cygnets
New Cygnets
Events
ALERTS
bETA
CME Arrival Time Prediction
ASAP Flare Monitor
UMA Proton Flux Forecast
SOHO EIT 171
SOHO EIT 171 (NRL)
SOHO EIT 195
1 2 3 4 5 6 7 8 9 10 11-15
Cygnet Control Panel
ENLIL Heliosphere Inner Planets (Velocity + Earth Field-Line Connectivity)
2011-05-23T18:00
2011-04-26T11 +27.27 days
Earth
Mars
Mercury
Venus
Messenger
Stereo_A
Stereo_B
Ecliptic Plane
LAT = -1.7°
N90
LON = 0°
W180
R = 1.0 AU
S90
E180
IMF polarity
Current sheath
3D IMF line
Date and Time:
5/23/2011
18:20:41
apply
1250
1600
2011-05-23 18:20:41.0
Cygnet Date Controls Options
Movie Mode Control

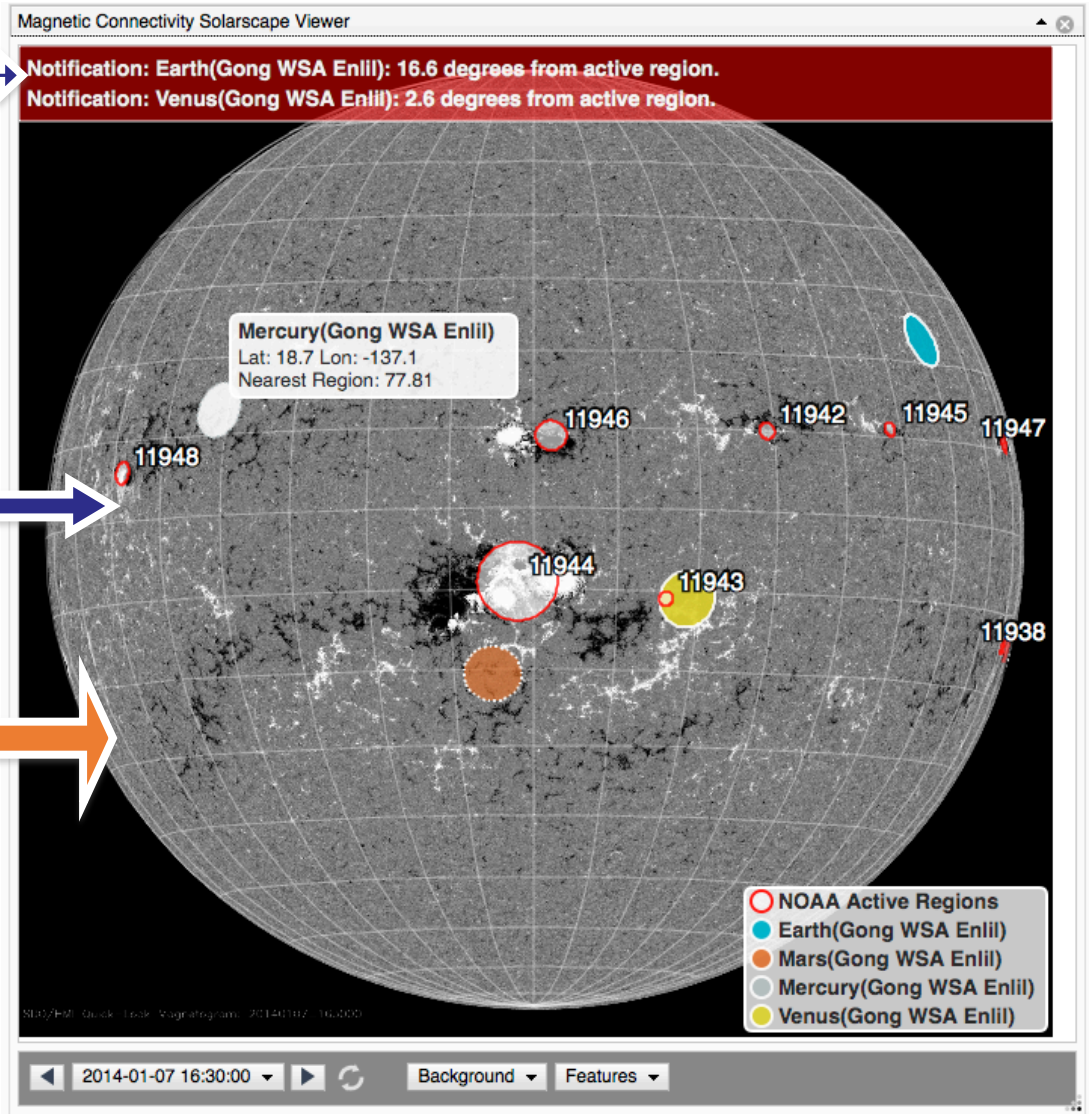
Dynamically Generated & Interactive Products: Solarscape



Alerts/Notifications

User Selectable Features
(MAG4, NOAA Active Regions,
CCMC Magnetic Connectivity)

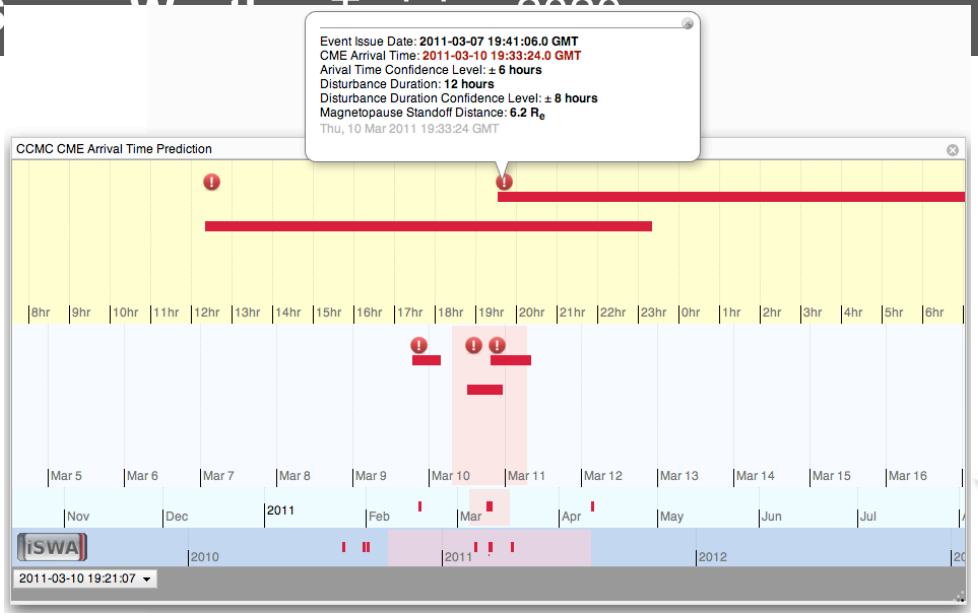
User Selectable Background
(SDO , Generic Grid)



Dynamic Product with User Selectable Features From Several Sources

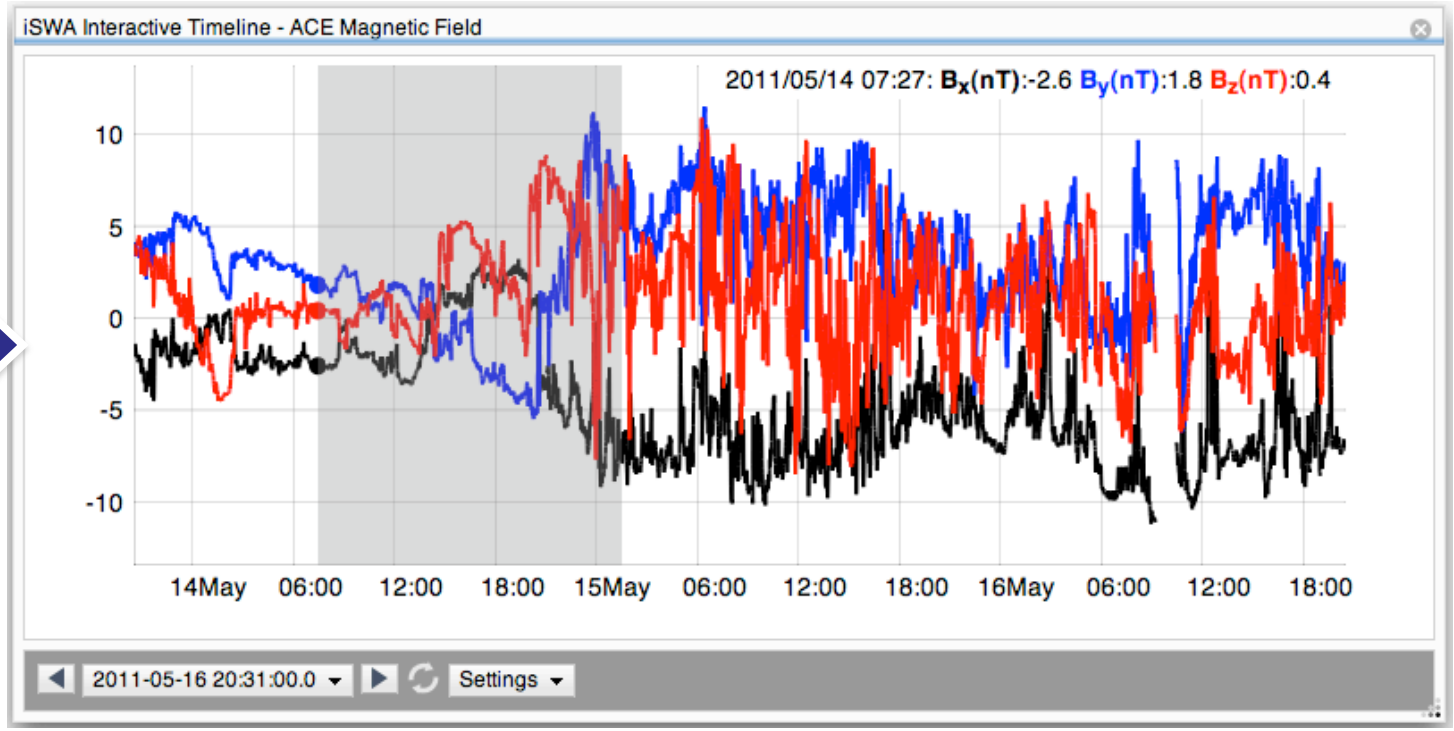
iSWA

Interactive Timelines



Interactive CME alert tool with chronological record of SWx Center issued CME time of arrival predictions

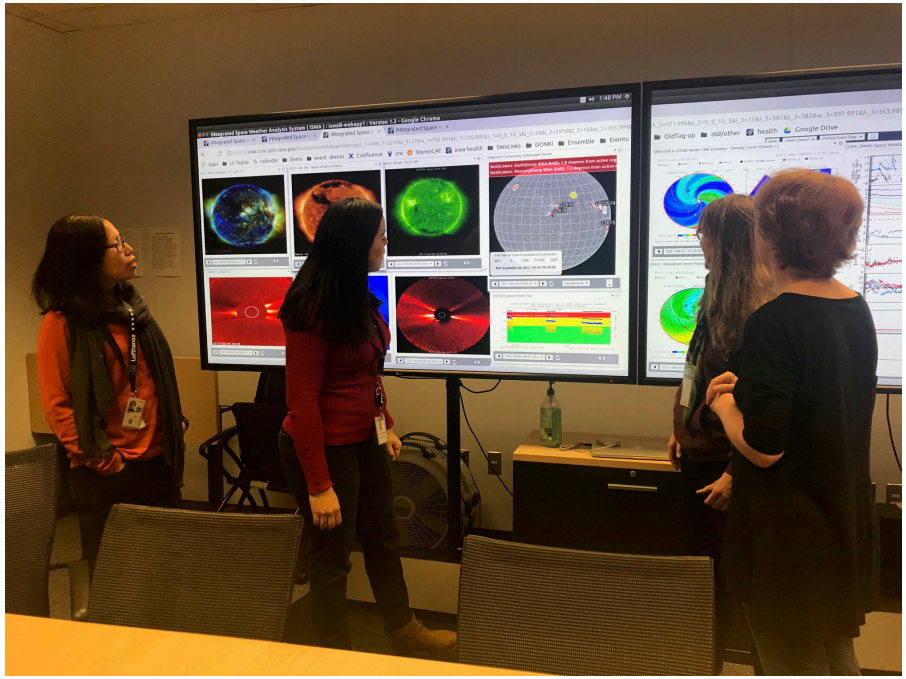
Interactive timeline tool with pan, zoom, mouse-over, and quantity toggling functionality



Services for NASA Robotic Missions Powered by iSWA

1. Providing assistance in spacecraft anomaly resolution by assessing whether space weather has any role in causing the observed anomaly/anomalies.

2. Sending out weekly space weather reports/summaries to NASA mission operators, NASA officials and involved personnel.

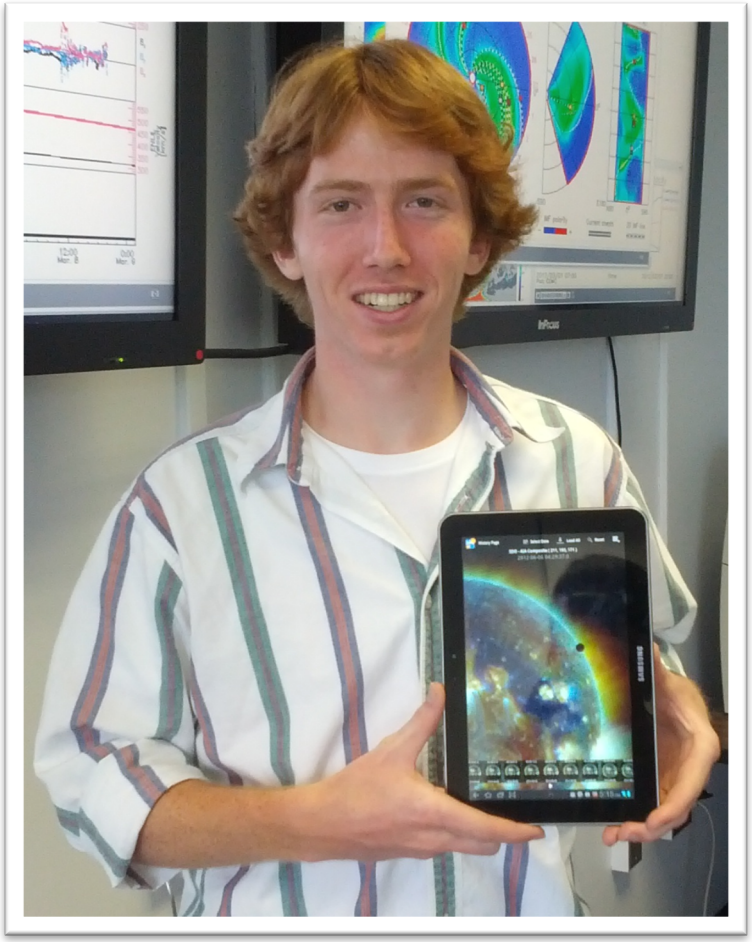


Education And Training Powered by iSWA

Undergraduate Computer Science Interns SW Research Analysis Tool Development Powered by iSWA

Jack LaSota
Web-based CME Analysis Tool

Justin Boblitt
Android iSWA App



[CME Tool Link]

[Sample Analysis Link]

iSWA Impact

NASA

- iSWA provides a new capability to quickly assess **past**, **present**, and **expected** space weather effects.
  - Mission operators have a resource to assist in both anomaly resolution as well as potential space weather impacts.
- iSWA has helped enable the **Space Weather Team** service **providing alerts**, anomaly reports, and weekly space weather summaries based on iSWA tools and products.

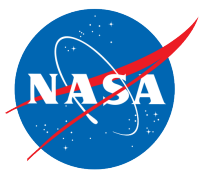
External Agencies

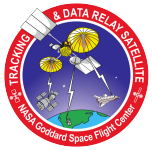
- Agencies can **monitor the iSWA system 24x7 for CME eruptions** and notify the CCMC as soon as an event is detected. Forecasters at the CCMC analyze the event and launch a simulation that **estimates the CME arrival time, duration, and expected impact on earth**.
- iSWA has enabled numerous collaborations with data, model, and product developers/providers who want their tools to be available in iSWA.

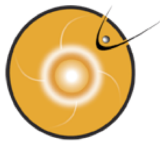
Science, Education, and Public Outreach

- Researchers, universities, and “citizen scientists” have access to a comprehensive suite of real-time and historical space environment data products.

Who Uses iSWA?













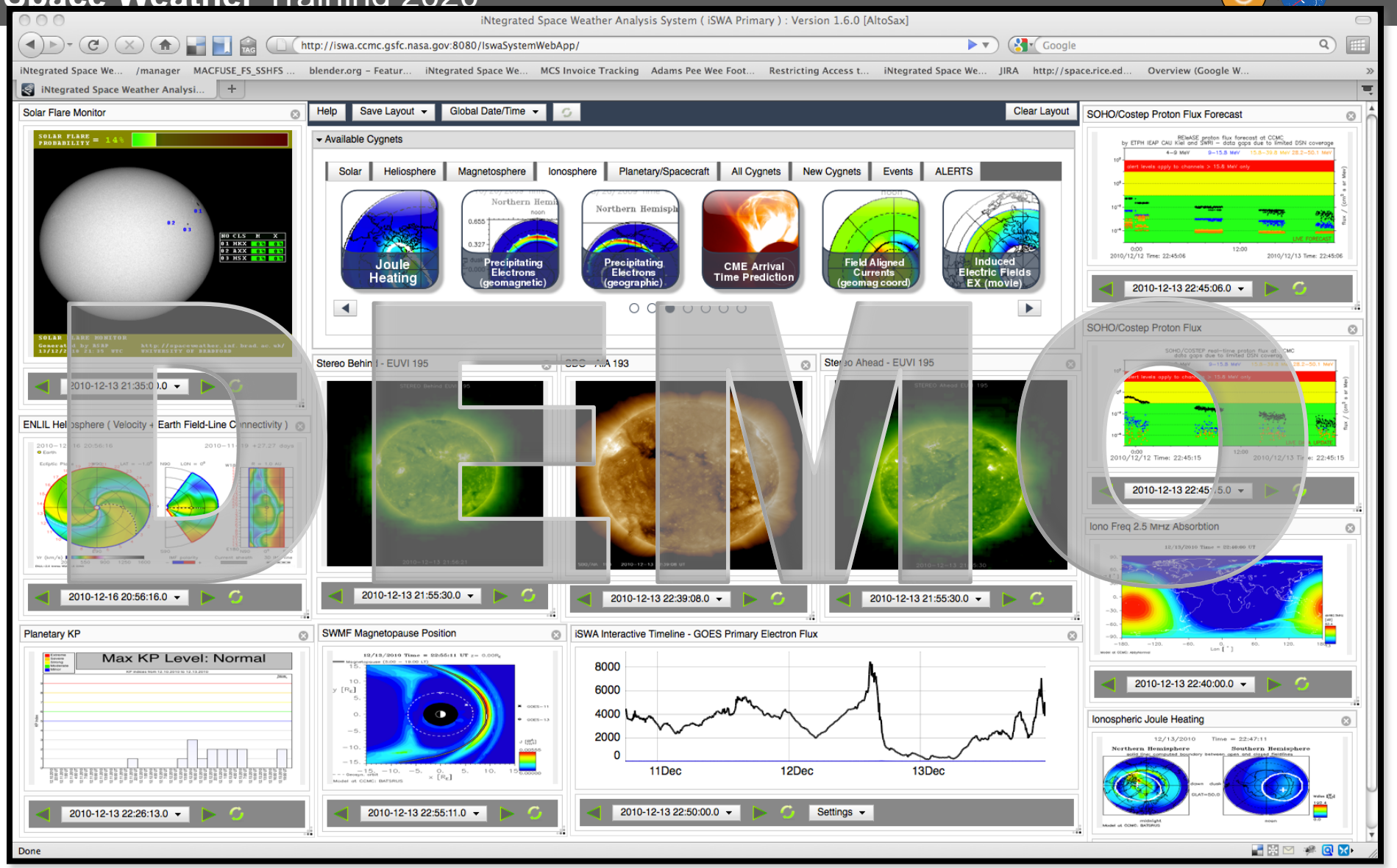

Potential Users

- Any agency, entity, or individual with space weather requirements and/or interests
- Extended educational use (training, K-12, higher education)
- Extended research use (case studies, correlation studies, historical events, general space weather research)

iSWA software can be applied to any agency, group, or project with general data ingestion, storage, management, display, & dissemination needs….

- "instant ground system" for other NASA projects
- turn-key software system for commercial and/or educational data management and dissemination
- customizable interface for existing data archives and sets

Space Weather Training 2020



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